(2.5) Verifying Properties of Geometric Figures

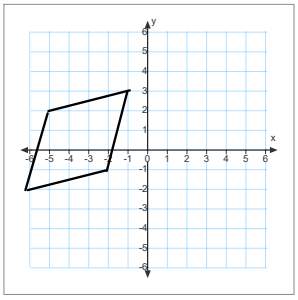
Use the properties of lines and line segments to verify properties of figures drawn on a coordinate grid.

Hints:

- Midpoint formula determines whether a point bisects a line segment
- Length formula calculates lengths of sides so they can be compared
- Slope formula determines whether sides are parallel (slopes equal), perpendicular (slopes negative reciprocals), or neither

Mar 17-2:19 PM

Example 1: Show that the diagonals of the rhombus with vertices at R(-5,2), S(-1,3), T(-2,-1), and U(-6,-2) are perpendicular and bisect each other.



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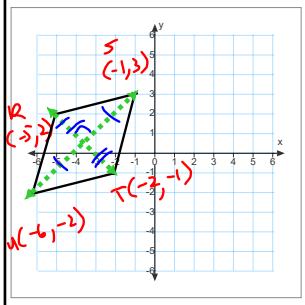

perpendicular
-ve rec

bisect
midpoint
distance

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Slopes

RT

R (-5,2) T (-2,-1)

x_1 y_1 x_2 y_2

US

U (-6,-2) S (-1,3)

x_1 y_1 x_2 y_2

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-1 - 2}{-2 - -5}$

$= \frac{-3}{+3} \Rightarrow -1$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{3 - -2}{-1 - -6}$

$= \frac{5}{5} \Rightarrow +1$

Therefore the slopes of the diagonals are perpendicular because the slopes are -ve reciprocals

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RT

R (-5,2) T (-2,-1)

x_1 y_1 x_2 y_2

US

U (-6,-2) S (-1,3)

x_1 y_1 x_2 y_2

$m = -1$

$m = +1$

Eqn of RT R(-5,2) (x y)

$y = -1x + b$

$2 = -1(-5) + b$

$2 = 5 + b$

$2 - 5 = b$

$-3 = b$

Eqn of US U(-6,-2) (x y)

$y = +1x + b$

$-2 = +1(-6) + b$

$-2 = -6 + b$

$-2 + 6 = b$

$+4 = b$

RT $y_1 = -1x - 3$

US $y_2 = +1x + 4$

$y_1 = y_2$

$-1x - 3 = +1x + 4$

$-3 - 4 = +1x + 1x$

$-7 = 2x$

$x = \frac{-7}{2}$

$y_2 = 1x + 4$

$y = 1(\frac{-7}{2}) + 4$

$y = -\frac{7}{2} + 4$

$y = -\frac{7}{2} + \frac{8}{2}$

$y = +\frac{1}{2}$

POI $(\frac{-7}{2}, \frac{1}{2})$

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RT

R (-5,2) T (-2,-1)

x_1 y_1 x_2 y_2

US

U (-6,-2) S (-1,3)

x_1 y_1 x_2 y_2

Midpoint

$M_x = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$

$(\frac{-5 + -2}{2}, \frac{2 + -1}{2})$

$(\frac{-7}{2}, \frac{1}{2})$

$M_x = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$

$(\frac{-6 + -1}{2}, \frac{-2 + 3}{2})$

$(\frac{-7}{2}, \frac{+1}{2})$

POI is same as midpoints of RT and US. Therefore they bisect each diagonal

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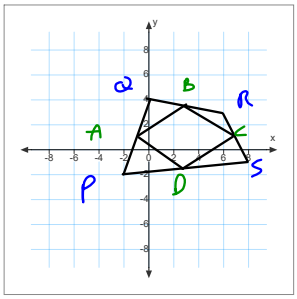
Example 2: Show that the midsegments of a quadrilateral with vertices at P(-2,-2), Q(0,4), R(6,3), and S(8,-1) form a rhombus.



Midpoints

distance of all midsegments

Slopes of midsegments

Complete q. 3 & 5 p. 109-110

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P(-2,-2), Q(0,4), R(6,3), and S(8,-1)

Midpoint PQ

$\frac{-2+0}{2}$ $\frac{-2+4}{2}$

$\frac{-2}{2}$ $\frac{+2}{2}$

$(-1, +1)$

Midpoint QR

$\frac{0+6}{2}$ $\frac{4+3}{2}$

$\frac{6}{2}$, $\frac{7}{2}$

$(3, 7/2)$

Midpoint RS

$\frac{6+8}{2}$, $\frac{3+-1}{2}$

$\frac{14}{2}$ $\frac{2}{2}$

$(7, 1)$

Midpoint SP

$\frac{8+-2}{2}$, $\frac{-1+-2}{2}$

$\frac{6}{2}$, $\frac{-3}{2}$

$(3, -\frac{3}{2})$

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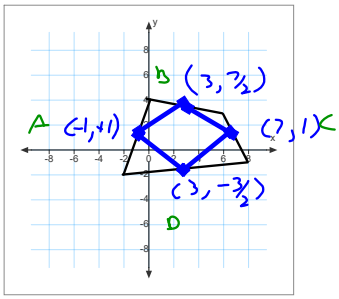

Complete q. 3 & 5 p. 109-110

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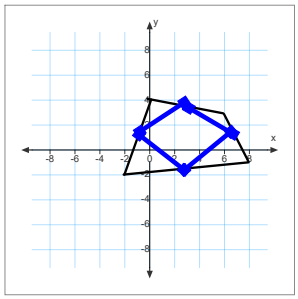

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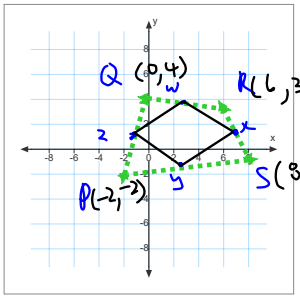

w $(3, 7/2)$

x $(7, 1)$

y $(3, -3/2)$

z $(-1, 1)$

Complete q. 3 & 5 p. 109-110

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w $(3, 7/2)$

x $(7, 1)$

y $(3, -\frac{3}{2})$

z $(-1, 1)$

WX vs ZY

$\sqrt{22.25}$ $\sqrt{22.25}$

4.7 4.7

ZW vs YX

$(-1,1)$ $(3, 7/2)$ $(3, -3/2)$ $(7,1)$

$d = \sqrt{(7/2 - 1)^2 + (3 - -1)^2}$

$d = \sqrt{(2.5)^2 + (4)^2}$

$d = \sqrt{6.25 + 16}$

$d = \sqrt{22.25}$

$d = 4.7$

$d = \sqrt{(7-3)^2 + (1 - -1.5)^2}$

$d = \sqrt{4^2 + 2.5^2}$

$d = \sqrt{16 + 6.25}$

$d = \sqrt{22.25}$

$d = 4.7$

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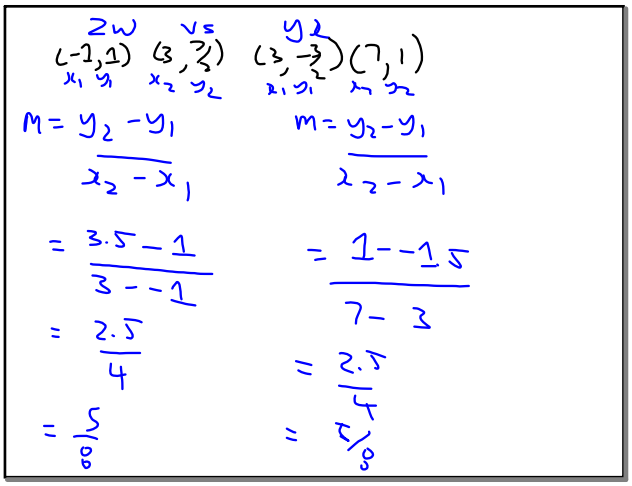

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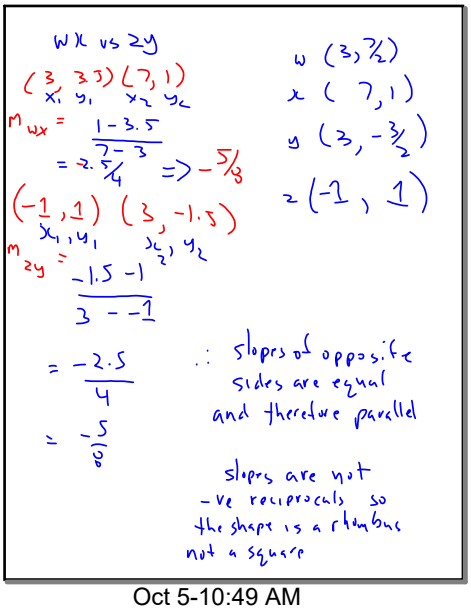

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